

EXHIBIT

4

DEFENDANTS' MOTION TO EXCLUDE
THE TESTIMONY OF
DR. CHRISTOPHER TEAF

05-CV-0329 GKF-PJC

1 IN THE UNITED STATES DISTRICT COURT
 2 FOR THE NORTHERN DISTRICT OF OKLAHOMA

3 STATE OF OKLAHOMA, ex rel,)
 4 W.A. DREW EDMONDSON, in his)
 capacity as ATTORNEY GENERAL)
 5 OF THE STATE OF OKLAHOMA,)
 et al.)

6 Plaintiffs,)

7 V.)

No. 05-CV-329-GKF-SAJ

8)
 9 TYSON FOODS, INC., et al.,)

10 Defendants.)

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 12
 13 REPORTER'S TRANSCRIPT OF PROCEEDINGS

14 FEBRUARY 20, 2008

15 PRELIMINARY INJUNCTION HEARING

16 VOLUME II

17
 18 BEFORE THE HONORABLE GREGORY K. FRIZZELL, Judge

19
 20 APPEARANCES:

21 For the Plaintiffs: Mr. Drew Edmondson
 22 Attorney General
 23 Mr. Robert Nance
 Mr. Daniel Lennington
 24 Ms. Kelly Hunter Burch
 Mr. Trevor Hammons
 25 Assistant Attorneys General
 313 N.E. 21st Street
 Oklahoma City, Oklahoma 73105

1 work that we do.

2 Q. Well, let's back up because maybe I misunderstood.

3 MR. BULLOCK: Judge, we're well past the half hour, I
4 just wonder when counsel is going to wrap up. I'm not trying
5 to hold people to specific --

6 MR. GEORGE: Two minutes, Your Honor.

7 THE COURT: Very good.

8 Q. (By Mr. George) I want to make sure I understand, Dr.
9 Teaf. You're not offering an opinion in this case regarding
10 the likelihood of transport of poultry litter to a water body
11 compared to other sources; is that correct?

12 A. No, I'm not. No, I'm not. I'm identifying sources, and
13 I'm identifying receptors.

14 Q. In fact, yesterday when you talked about -- I think you
15 threw out some percentages in terms of cattle manure versus
16 poultry litter. You were talking just about your analysis of
17 how much hits the ground, not how much gets to the water;
18 correct?

19 A. And subsequent to that I discussed the importance of
20 knowing how it may make its way to the water body, yes, sir.

21 Q. But you're not offering an opinion as to whether it got
22 there or not because you're not offering a fate and transport
23 opinion; correct?

24 A. Well, I am offering an opinion about that it got there and
25 I'm offering it for two reasons. One, the bacteria levels are

1 very high and second of all, the signature that was identified
2 is of cattle -- is of poultry.

3 Q. You're relying upon the work of Dr. Roger Olsen for your
4 belief that the water shows the evidence of poultry
5 contamination; correct?

6 A. In part I am and I'm also relying upon that of Dr. Harwood
7 and the other lines of evidence that I described yesterday.

8 Q. But you yourself, sir, have conducted no fate and
9 transport analysis; correct?

10 A. No, I did not, not a formal one, no.

11 Q. Sir, based upon the work that you've done in this case,
12 not the work of others, can you state to a reasonable degree of
13 scientific certainty that if Judge Frizzell grants the
14 injunction that is requested by your client, the water quality
15 standards for bacteria in the Illinois River will be met in
16 2008 and 2009?

17 A. My opinion is that they will be.

18 Q. Can you state that opinion to a reasonable degree of
19 scientific certainty?

20 A. I can based on the information that I have reviewed.

21 Q. You're willing to stake your professional reputation on
22 the proposition that if this Court enters the injunction sought
23 by your client, the water quality standards for bacteria in the
24 Illinois River will be met next year?

25 A. Based on all the information that I have and my knowledge

1 A. Yes, there is. And the reason that I just didn't recall
2 at the time -- the Wise County cases involved bacterial growth
3 producing hydrogen sulfide in residential wells as a
4 consequence of the introduction of natural gas and condensate.
5 So I didn't think about them as coming from the surface, but
6 the contaminant of concern was hydrogen sulfide is microbially
7 produced.

8 Q. Sir, you were not asked to evaluate in that case the fate
9 and transport of bacteria found in groundwater, were you?

10 A. No.

11 Q. You were simply evaluating the effects of groundwater --
12 I'm sorry, of bacteria found in certain wells?

13 A. That's correct.

14 Q. So as it stands today, sir, you have never before worked
15 on a litigated matter in which you were asked to offer an
16 opinion as to the fate and transport of bacteria to
17 groundwater?

18 A. That's correct.

19 Q. Sir, prior to being retained by the Plaintiffs' lawyers
20 representing the attorney general's office in this case, had
21 you ever worked on a research project or published a paper
22 related to the movement of bacteria in either surface water or
23 groundwater?

24 A. No.

25 Q. Sir, have you ever had your opinions in an environmental

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UNITED STATES COURT REPORTER

1 Q. And elsewhere?

2 A. Yes. And Salmonella was identified in edge of field
3 samples and enumerated.

4 Q. Really?

5 A. Yes.

6 Q. You don't agree that the State took 68 samples for soil
7 and found none with Salmonella in them?

8 A. No, I wasn't talking about soil. I was talking about edge
9 of field. But soil, that could well be. I don't disagree.

10 Q. So what the State did find was fecal indicator bacteria,
11 that's right?

12 A. The State did find fecal indicator bacteria, yes.

13 Q. Let's bring up Defendants' Demonstrative 33, if we can. I
14 think this might help lay out what we've been talking about. I
15 think it's 32. I'm sorry to have used the wrong number, it's
16 32. Okay. So you talked about fate and transport, you did not
17 do a fate and transport analysis in this case?

18 A. Correct.

19 Q. Okay. So let's talk about what fate and transport is.
20 What do you see on your screen there?

21 A. Well, can I restate that for a second or can I please
22 restate my answer?

23 Q. Sure.

24 A. We didn't do a specific fate and transport analysis, but
25 we did construct our sampling regime so as to be able to assess

1 Q. It's very prevalent.

2 A. It's -- it is common in many areas and -- but it's
3 certainly more associated with fecally contaminated areas.

4 Q. Okay. And it comes from many sources?

5 A. That's right.

6 Q. As a matter of fact, almost every animal who sheds feces
7 sheds fecal indicator bacteria?

8 A. Correct.

9 Q. So in the field I believe you testified that -- well, let
10 me back up. So generally speaking, a fate and transport
11 analysis, it refers to the elements and attributes that affect
12 a bacterium's survival rate in the environment and the speed
13 and manner with which it moves; is that right?

14 A. Those are some of the parameters that one investigates.

15 Q. Okay. So in a traditional fate and transport analysis,
16 you're trying to see if something gets from point a to point B
17 and how it might get there?

18 A. Yes, simplistically put.

19 Q. And it's much more important to do fate and transport or
20 to understand that kind of a process where you have multiple
21 sources of the item that you are looking for?

22 A. Can you ask me that question a different way? I'm not
23 sure I follow.

24 Q. Sure. Isn't fate and transport that much more complex
25 when the items that you're studying, the bacteria that you are

1 Q. -- than if they were spread out on a field?

2 A. Correct.

3 Q. And if you were to spread out bacteria on the field in a
4 thin, fine dust and thereby expose them to sunlight, those
5 would die within a few hours?

6 A. Well, that depends on what you mean by a thin, fine dust.

7 Q. Thin enough that they could see the sunlight, they could
8 be exposed to the sunlight?

9 A. If they are directly exposed, then they -- we're going to
10 have a pretty high inactivation rate as long as they don't make
11 it into the soil. If they do make it into the soil, then
12 they'll be protected.

13 Q. And in talking about those same factors, dryness kills
14 bacteria. I believe you used the word desiccation by that, but
15 you mean dryness; right?

16 A. Correct.

17 Q. And that kills bacteria?

18 A. Correct.

19 Q. So the same thing, a cow pie shelters bacteria by keeping
20 in the moisture; is that right?

21 A. Compared to?

22 Q. Compared to a thin dust?

23 A. Yeah, compared to a thin dust.

24 Q. Now, you're not offering an opinion in this case as to the
25 relative rates of movement of bacteria that you've studied and

1 testified about; is that right?

2 A. Not to the relative rates of movement, no.

3 Q. In fact, as part of your work in this case, you did not
4 study the movement characteristics of any type of bacteria in
5 the watershed, did you?

6 A. No, I did not.

7 Q. Nor are you offering any opinion today about the different
8 survival rates of the different bacteria in the Illinois River
9 Watershed?

10 A. Can you rephrase that, sorry.

11 Q. Are you offering any opinion today as to the relative
12 survival rates of the bacteria that you found in the watershed?

13 A. No.

14 Q. And you didn't study under what conditions and how long
15 bacteria survived in this watershed, did you?

16 A. No, but we have done extensive studies of that in my lab.

17 Q. But you didn't study it here in the watershed?

18 A. Not in the watershed, no.

19 Q. Now, let's focus on the barn there on the screen. I've
20 got that up as a representative of a poultry house. You don't
21 know very much about the survivability of bacteria in poultry
22 litter lying on a poultry house floor, do you?

23 A. I know that they're in a relatively stressful situation in
24 that environment but I think you said relative survivability?

25 Q. Right.

1 A. Meaning with respect to one another?

2 Q. To each other, to one another.

3 A. We know that Enterococci tend to survive better than
4 E. coli in poultry litter. That's one thing that's fairly
5 well-established in the literature.

6 Q. And you know that poultry litter in houses is often
7 layered, multiple layers go in?

8 A. Yes.

9 Q. And it sits there for a while?

10 A. Yes.

11 Q. Do you have an opinion whether the time that passes and
12 the layering kills off the bacteria?

13 A. I would -- my opinion would be that -- which I haven't
14 tested as we've established, but my opinion would be that the
15 bacteria on the top layer of litter -- there are probably more
16 viable and culturable bacteria on the top layer of the litter
17 than there are at lower layers.

18 Q. And the ones at the lower layers would be dead or dying?

19 A. Well, they would be stressed at least.

20 Q. So you didn't study how long bacteria can survive laying
21 out in a field after they were removed from a poultry house,
22 did you?

23 A. Not specifically.

24 Q. You didn't study the specific fate and transport
25 characteristics of bacteria moving between fields in the

1 watershed, did you?

2 A. No, I did not.

3 Q. And you didn't study the bacterial survival
4 characteristics in the streams in the IRW?

5 A. Not specifically in the streams. Although again, we've
6 done a lot of work in my labs, so I have a strong basis for
7 opinions about that.

8 Q. You're not offering an opinion in this case as to the
9 relative bacterial survival characteristics in the streams, are
10 you?

11 A. You'd have to be a little bit more specific in your
12 question.

13 Q. Did you study bacterial survival characteristics in the
14 streams in the Illinois River Watershed?

15 A. Not in terms of an experimental study, no.

16 Q. All right. Let's walk through this demonstrative. So in
17 a traditional fate and transport, you start in the poultry
18 house, you move to the field where the litter is applied. And
19 then you have to track how the litter moves, if at all, how
20 bacteria in the litter move, if at all, as they encounter an
21 edge of a field; is that right?

22 A. Well, there's all sorts of ways that you can design a
23 study like that.

24 Q. Is that one way --

25 A. It depends on your questions.

1 Q. Is that one way to design it?

2 A. That is one way to design it.

3 Q. Then at the edge of a field you might encounter another
4 field; is that right?

5 A. The edge of a field would be the edge, there would be
6 something there to stop it.

7 Q. There would be something there to stop the bacteria from
8 moving off the edge of the field?

9 A. No, there would be -- an edge of a field means an edge.
10 There's something else there, a road, a ditch, something.

11 Q. Or another field?

12 A. I'd call that the same field.

13 Q. Okay. So it's your testimony that in the Illinois River
14 Watershed all fields end in either a road or a ditch?

15 A. My concept of the term -- I'm sorry. Can I explain just
16 briefly? My concept of what an edge of field is, is it's the
17 end of a large, grassy expanse that would make up a field and
18 then there would be something that would interrupt that grassy
19 expanse, whether it be a ditch or a ditch and a road or a
20 structure or something.

21 Q. And did you observe the sampling in this case?

22 A. No, I did not.

23 Q. So do you know if at the edge of the field, there was
24 simply another field or always a ditch or a road?

25 A. In the edge of field samples that were collected in this

1 case, there was some sort of a ditch or a depression in which
2 water could collect because those were water samples, the edge
3 of field samples.

4 Q. So there were never -- if other witnesses have testified
5 that there were puddles at the edge of a field, you contradict
6 them?

7 A. No, I said a depression or a ditch or something where they
8 could collect the water.

9 Q. In fact, you don't know what was at the edge of the field;
10 isn't that right?

11 A. From what I've been informed, it's usually a ditch.

12 Q. In cases where it's a ditch or not a ditch, if there's
13 another field beyond it, let's move through that, and then
14 let's move through the demonstrative, and eventually then you
15 reach the stream. If the question you are trying to address in
16 a traditional fate and transport, and this is what I'm trying
17 to bring out, that the bacteria in the stream came from the
18 poultry house, don't you have to track it across the
19 environment?

20 A. To demonstrate what?

21 Q. If you are trying to show --

22 MR. JORGENSEN: Your Honor, may I approach the
23 demonstrative? It might help. We're having some trouble,
24 maybe I can cut it short.

25 THE COURT: Yes.

1 Q. (By Mr. Jorgensen) Was the question that you were trying
2 to address in this case, Dr. Harwood, whether bacteria that are
3 found in the streams, whether those came from poultry litter?
4 Is that the question you were trying to address?

5 A. Not directly whether bacteria that came from one
6 particular field were in one particular stream, but whether
7 there was a gradient of these signals from one compartment, in
8 other words, from one type of sampling entity to another.

9 Q. So the bacteria that you find in a stream, E. coli, let's
10 take that for example, they could come from cattle; right?

11 A. In certain streams there would be some possibility for
12 contamination from cattle.

13 Q. They could come from birds?

14 A. There could be a bird component.

15 Q. If you found Salmonella, it could come from reptiles?

16 A. Salmonella has been isolated from reptiles.

17 Q. So if you found Salmonella in the streams of the Illinois
18 River Watershed, it could come from reptiles? I'm not trying
19 to trick you with these questions. I'm actually trying to
20 clarify what you did.

21 A. So if I found Salmonella at an edge of the field sample I
22 would --

23 Q. If you found Salmonella in the streams of the Illinois
24 River Watershed, they could come from reptiles?

25 A. They could come from other sources other than -- than that

1 field, yes.

2 Q. And it was your job to help the plaintiffs understand
3 whether the bacteria that you found in water, groundwater or
4 streams, whether it came from poultry litter?

5 A. It was my job to determine whether or not there's a
6 correlation between the practices of land applying this poultry
7 litter and the contamination that's appearing in streams,
8 that's how I would phrase it.

9 Q. And you did not do that through a traditional fate and
10 transport analysis, you did it through the microbial source
11 tracking we were just talking about?

12 A. We did the microbial source tracking, yes, as a way of
13 determining whether or not we had a specific poultry litter
14 signature in that water.

15 Q. All right. Now, let's talk for just a moment about the
16 animals that live in the Illinois River Watershed. Pigs carry
17 Campylobacter; is that true?

18 A. Pigs are not well-known to carry Campylobacter. I'm sure
19 there's been a couple of studies that have found them.

20 Q. And Salmonella also, don't pigs also carry Salmonella?

21 A. Yes, pigs carry Salmonella.

22 Q. Most reptiles, I think we established, carry Salmonella?

23 A. I wouldn't say most reptiles, but I know they've been
24 isolated from some.

25 Q. Humans contribute fecal matter to the Illinois River

1 Watershed directly?

2 A. Hopefully not.

3 Q. You don't know whether they contribute it directly?

4 A. No, I don't know.

5 Q. Let's look at page 186, line 14 of your deposition. Page
6 186, lines 14 to 21.

7 (An excerpt of the videotaped deposition of Valerie
8 Harwood was played.)

9 Q. "So humans can contribute fecal bacteria to waterways
10 directly?

11 A. "Directly, yeah, and also through their waste disposal
12 systems.

13 Q. "Okay. And are septic systems a potential source of fecal
14 pathogen contamination?

15 A. "Septic systems can be if they're not properly constructed
16 to be separated from the water table."

17 Q. (By Mr. Jorgensen) Dr. Harwood, you haven't studied how
18 many species of animals live in the watershed, have you?

19 A. No.

20 Q. You don't know how many types of birds live in the
21 watershed?

22 A. No.

23 Q. You haven't studied the migration patterns of birds
24 through the watershed?

25 A. Not directly, no. I've had some information on it, but I

1 have not myself studied that.

2 Q. You did not quantify the volume of manure deposited by
3 each different type of animal in the watershed, did you?

4 A. Not myself, no. Although I have seen information on the
5 subject again and I know that annually in the Illinois River
6 Watershed there's about 350,000 tons of poultry litter land
7 applied. I know that from Chris Teaf's work, that the volume
8 of, for example, poultry litter is one of the dominant sources
9 of fecal material contributed.

10 Q. Let's look at page 72, 19 of your deposition, 72, 19 to
11 21.

12 (An excerpt of the videotaped deposition of Valerie
13 Harwood was played.)

14 Q. "Did you attempt to quantify the type of manure from each
15 type of animal in the watershed?

16 A. No, I did not."

17 MR. JORGENSEN: And Then let's go to page 121, line 25
18 to 122, 2 of your deposition.

19 (An excerpt of the videotaped deposition of Valerie
20 Harwood was played.)

21 Q. "Do you know the per capita fecal production of any living
22 animal in the IRW?

23 A. "No."

24 MR. JORGENSEN: And then let's go to page 72, line 25
25 to page 73, 3.

1 (An excerpt of the videotaped deposition of Valerie
2 Harwood was played.)

3 Q. "Did you attempt to quantify the volume of bacteria that
4 come from each type of animal in the watershed?

5 A. "No, I did not."

6 MR. PAGE: Your Honor, I object to that use of the
7 deposition. Her testimony was not that she tried to do it, but
8 that she reviewed other people's materials, and that deposition
9 statement there did not contradict her statements.

10 THE COURT: The question on the record that
11 Mr. Jorgensen asked, I thought had to do with an attempt to
12 quantify the type of manure. Just one second.

13 MR. PAGE: I believe the question, if I heard it
14 correctly was, did she attempt to quantify it.

15 THE COURT: You have not determined the volume of
16 manure deposited by each type -- I can't make it out -- of the
17 watershed.

18 MR. JORGENSEN: I'm actually reading from a little
19 script. So it's, "You did not attempt to quantify the volume
20 of manure deposited by each type of animal in the watershed,
21 did you?" And then the direct response is 72, Lines 19 to 21.

22 THE COURT: Overruled.

23 Q. (By Mr. Jorgensen) Dr. Harwood, did you attempt to
24 quantify the volume of bacteria deposited by pets in the
25 watershed?

1 A. No.

2 Q. Did you attempt to quantify the volume of bacteria, I'm
3 not talking about the manure, but the bacteria in the manure
4 deposited by humans in the watershed?

5 A. No.

6 Q. And you don't know whether anyone else on the State's team
7 did any of these things, do you?

8 A. There was -- material was reviewed as to the relative or
9 the amounts of animal feces that would be deposited in or that
10 could contribute to impairments in the watershed, but that
11 material -- that research was not done by me.

12 Q. And you're talking about the amounts of feces, not the
13 volume of bacteria in the feces?

14 A. Correct.

15 Q. You didn't study the effects of urban runoff on bacterial
16 loading in the watershed, did you?

17 A. No.

18 Q. All right. We've covered the things that you did and that
19 you didn't do. Let's move to the science of microbial source
20 tracking generally. Now, microbial source tracking, it's a
21 young science; is that right?

22 A. I would say it started in 1996 or so, depending on where
23 you start, so, yeah, it's 20 years old.

24 Q. Would you agree that it's still developing?

25 A. Yes, much as all of microbiology is developing.

1 objection. The statement was merely as background, and the
2 objection is overruled. Then go to the substance of the
3 question. You may answer it.

4 A. Well, I think the answers are both correct. There's no
5 smoking gun, so you can say it isn't helpful. On the other
6 hand, it's very helpful because it's what you see with national
7 data and it's not higher than you would expect in these
8 counties in the watershed. So I think it's quite helpful to me
9 and it was helpful to me in arriving at a conclusion that there
10 was not a special problem in these areas. And I think it was
11 helpful to Dr. Crutcher as well.

12 Q. (By Mr. Ryan) Did that information tell you whether the
13 Salmonella or Campylobacter was waterborne or not?

14 A. Not at all.

15 Q. Now, did you review the data of the State's water sampling
16 in this case?

17 A. I did.

18 Q. And what did this tell you in terms of whether there's a
19 risk to human health --

20 A. Well, I looked --

21 Q. -- from the actual water sampling conducted by the State?

22 A. I looked at the actual raw data, I mean, I spent some time
23 on this. And what was found from a lot of microbiology,
24 thousands of samples were looked at for Salmonella and many for
25 Campylobacter and there were very low positivity rates and the

1 counts were extremely low.

2 Q. What does that tell you in terms of, even if it were from
3 a human source, what would that tell you in terms of whether
4 someone was going to get ill?

5 A. I think the counts of these organisms in that water are
6 very, very low, mainly negative. And most of the samples that
7 were positive were edge of field samples and things that are
8 not relevant to any risk.

9 Q. And again, with respect to whatever is there in the water,
10 whatever the level is, does it have to be ingested?

11 A. It does.

12 MR. RYAN: That's all I have, Your Honor.

13 THE COURT: Cross-Examination.

14 CROSS-EXAMINATION

15 BY MR. BULLOCK:

16 Q. Doctor, in preparation for your testimony here today, did
17 you do any testing of any environmental samples at all in the
18 IRW?

19 A. I did not.

20 Q. Okay. Did you sample any waste from poultry barns?

21 A. I did not.

22 Q. Did you ask your -- you're working for the poultry
23 integrators, correct, in this occasion?

24 A. I guess I am.

25 Q. Okay. Did you ask them to do any testing?

1 A. It would over -- it would over represent any risk
2 associated there. You could have the indicators come through
3 and the pathogens die before they even get to the water, but
4 some of the indicators still make it.

5 Q. Now, while you're talking about that fate and transport,
6 do all bacteria respond to environmental conditions the same?

7 A. Not at all, not at all. Great deal of difference.

8 Q. Can you explain some of the conditions that might cause
9 different responses?

10 A. The growth rate, the factors are numerous. Could be pH,
11 sunlight, exposure to oxygen, temperature, nutrient
12 requirements. There are a plethora of factors that affect
13 survival.

14 Q. Let me follow the pathway that you laid out, Doctor. Let
15 me start -- I believe you mentioned in the feces. Have you
16 reviewed the State's testing for actual pathogens in the
17 Illinois River Watershed?

18 A. I have.

19 Q. What did you discover from that review?

20 A. They found virtually no pathogens.

21 Q. Now, have you heard here in court the State's experts
22 explain that they couldn't find actual pathogens because those
23 pathogens might be -- I think the phrase was viable but
24 non-culturable?

25 A. I have.